## REMARKS

Claims 13 to 15, 18 to 19, and 21 to 32 are pending in this patent application. Claims 1 to 12, 16 to 17, and 20 have been canceled, without prejudice, in a previous Reply.

Claim 14 has been amended to correct a typographical error.

The Action includes a rejection of the pending claims as allegedly being unpatentable under 35 U.S.C. § 103(a). In view of the following remarks, reconsideration and withdrawal of the rejection is respectfully requested.

### Discussion of the Rejection Under 35 U.S.C. § 103(a)

Claims 13 to 15, 18 to 19, and 21 to 32 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,954,977 to Kaufman et al. ("Kaufman 1") in view of U.S. Patent No. 6,063,306 to Kaufman et al. ("Kaufman 2") and further in view of U.S. Patent No. 5,759,917 to Grover et al. ("Grover"). More particularly, the Office alleges that it would have been obvious to modify the chemical mechanical polishing solution of Kaufman 1 to include abrasive particles within the size range taught by Grover. The Office further alleges the polishing solution of Kaufman 1, as modified by Grover, would have ingredients similar to those of the claimed composition and, thus, the composition would have the same void volume ratio.

Applicants respectfully traverse this rejection for at least the following reasons: (1) the Office's reliance on Grover as teaching abrasive particles having a size from 500 microns to 2000 microns (***micrometers***) is misplaced in view of the reference's actual teaching of a chemical mechanical polishing solution comprising abrasive particles having a size range of 40 to 1000 nm (***nanometers***); and (2) the Office's assertion of inherency is erroneous because (a) it is improper to modify a composition based upon an inherency theory where the alleged inherent properties do not always and necessarily flow from the composition; (b) contrary to the Office's assertions, neither of the cited references teach abrasive particles that are 500 to 2000 microns in size; and (c) a slurry's void volume ratio is not an inherent characteristic of its ingredients, *per se*, but instead is a function of the slurry's particle size, shape, and distribution.

## A. The Claimed Invention

Applicants' claimed invention defines a chemical mechanical polishing ("CMP") mixture comprising, in part, a plurality of particles having an ***average particle diameter ranging from about 500 to 2000 μm***, and optionally a ***void volume ratio of less than about 1***. Applicants have surprisingly found that CMP mixtures with large, preferably non-abrasive, particles advantageously remove excess copper material from a semiconductor substrate without causing defects such as dishing or scratches in the underlying dielectric layer.

The size of the particles in Applicants' polishing slurry is an important aspect of the claimed invention because it impacts the slurry's polishing performance. For example, if the particles are too small, they cannot deliver enough impact energy to the surface and, thus, the mechanical action becomes too weak to effectively remove residues. On the other hand, if the particles are too big, the opposite occurs – *i.e.*, the mechanical action becomes so strong that it can scratch, for example, a flat silicon oxide surface. Applicants have surprisingly discovered that superior polishing is achieved using particles that preferably have an average diameter from about 500 to about 2000 μm.

## B. Arguments

### 1. Obviousness

To render a claim *prima facie* obvious, a reference or a combination of references must teach each and every element of that claim. MPEP 2143.03. Here, the combination of references cited by the Office does not teach a polishing slurry having particles of 500 to 2000 microns in size and, thus, does not render the claimed invention unpatentable under 35 U.S.C. § 103(a).

The Office acknowledges that Kaufman 1 fails to teach the claimed range of particle sizes (see the Action, p. 3) and Applicants note that Kaufman 2 similarly fails to teach the claimed range of particle sizes. The Office alleges that Grover teaches a chemical mechanical polishing solution comprising abrasive particles having a size range that overlaps the claims particle size range (i.e., 500 to 2000 microns). Significantly, however, the chemical mechanical polishing solution of Grover actually comprises abrasive particles having a size range of 40 to 1000 ***nanometers*** (nm). Since 1 micron (μm) = 1,000 nanometer (nm), the abrasive particles taught by Grover are 0.04 to 1 microns in diameter. Comparing the abrasive particles of the claimed invention to those of Grover shows that the smallest claimed particles are ***at least 500 times larger than the largest particles of Grover***. The references cited by the Office, therefore, do not teach or suggest each and every element of the claimed invention, and thus their combination does not render the claimed invention obvious.

### 2. Inherency

With respect to claims 14 and 28, the Office acknowledges that Kaufman 1 is silent regarding void volume ratio, but alleges that such a property nevertheless would be inherent to a composition of Kaufman 1 as per the proposed modification in view of Grover. In this regard, the Office alleges that "the modified invention of Kaufman 1 provides for similar ingredients as applicants' claimed invention and therefore would have similar properties, such as applicants' claimed range of void volume [ratio]" (the Action, p. 4 – 5). Thus, the Office argues that, although Kaufman 1 does not completely disclose the claimed invention, the invention nevertheless is anticipated by Kaufman 1 because its void volume ratio would be inherent in view of Grover.

This rejection is respectfully traversed for at least three reasons: (1) in determining whether a property of a composition is inherent, it is not proper to consider modifications of the composition because the inherent property must necessarily flow from the reference's teachings; (2) assuming, arguendo, that the teachings of Kaufman 1 and Grover could be combined, Grover does not teach abrasive particles of 500 to 2000 microns in size as suggested by the Office; and (3) even assuming, arguendo, that the teachings of Kaufman 1 and Grover could be combined and that Grover taught abrasive particles in the size range suggested by the Office, a slurry's void volume ratio is not an inherent characteristic of its ingredients, per se, because void volume ratio is a function of the slurry's particle size, shape, and distribution.

With respect to Kaufman's alleged anticipatory effect, Applicants note that a reference is anticipatory only if it discloses, either explicitly or intrinsically, each and every element of a claim. Thus, an anticipation rejection is *per se* improper if a reference must be modified to arrive at the claimed invention. Such modifications are particularly improper to support a theory of inherency because it is well established that inherent properties of a composition ***necessarily*** flow from that composition. *Ex parte Levy*, 17 USPQ2d 1461 (BPAI 1990). If Kaufman's composition must be modified to arrive at the claimed composition (as proposed by the Office), then the allegedly inherent property does not, and in fact cannot, necessarily flow from the Kaufman composition.

With respect to the Office's assertion that Grover teaches abrasive particles of 500 to 2000 microns in size, such an assertion is misplaced because, as shown above, Grover actually teaches a polishing slurry comprising abrasive particles having a size range of 40 to 1000 ***nanometers***. Thus, even if the teachings of Kaufman 1 could be modified in view of Grover to show an inherent characteristic of the modified slurry, such a composition still would not possess the physical properties proposed by the Office.

The Office's assertion that two slurries composed of similar ingredients would possess the same void volume ratio is not consistent with the meaning of void volume ratio as provided in the Affidavit by Mr. Seong filed August 16, 2007. In paragraphs 6 to 8 of Mr. Seong's Affidavit, void volume is shown to correspond to the volume of space created between solid particles of a slurry, and that this space volume is dependent upon such parameters as the geometry of individual particles and their packing density. Since the void volume is a function of the shape, size, and distribution of the slurry's particles, as opposed to a function of the slurry's ingredients *per se*, the void volume of a slurry is not an inherent property of the slurry's ingredients as suggested by the Office.

Accordingly, for at least the abovementioned reasons, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) is requested respectfully.

## Conclusion

Applicants believe that the foregoing constitutes a complete and full response to the Action of record. Applicants respectfully submit that this application is now in condition for allowance. Accordingly, an indication of allowability and an early Notice of Allowance are respectfully requested.

The Commissioner is hereby authorized to charge the fee required and any additional fees that may be needed to Deposit Account No. 01-0493 in the name of Air Products and Chemicals, Inc.

Respectfully submitted,

/Joseph D. Rossi/

Joseph D. Rossi
Registration No. 47,038
7201 Hamilton Boulevard
Allentown, PA 18195-1501
(610) 481-8169

N:\DOCNOS\06300-06399\06324P\US\Amends\06324P USA Reply to OA dated 10-31-07.doc